TURF GRASS MANAGEMENT
Curriculum Content Framework

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Curriculum Content Framework

TURF GRASS MANAGEMENT

Grade Levels: 9, 10, 11, 12
Course Code: 491360

Prerequisites: Agriculture Science & Technology or Agriculture Science

Course Description: This course covers all aspects of turf grass management, including lawn care, turf production, golf course management, sports turf, irrigation, equipment, maintenance, and human relations.

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Unit 1: Lawn Care & Turf Production
20 Hours

Terminology: Auricle, Bahia grass, Bermuda grass, Bunch-type, Centipede grass, Collar, Cool-season turf grasses, Crown, Cultivars (varieties), Cultivation, Dethatch, Drop spreader, Embryo, Endosperm, Essential nutrient elements, Evaporation, Evapotranspiration, Fertilizer, Fertilizer analysis, Fine fescues, Germination, Growth habit, Inflorescence, Inorganic fertilizer, Kentucky bluegrass, Lawn, Lawn-care service owner, Lawn-care technician, Leaf blade, Leaf sheath, Ligule, Mulching, Organic fertilizer, Perennial ryegrass, pH, Plugging, Primary root, Professional lawn care, Renovation, Rhizome, Rotary mower, Rotary spreader, St. Augustine grass, Scalping, Secondary roots, Seed, Seedbed, Seed coat, Seed quality, Seed spreader, Shoot, Sod, Soil analysis, Soil profile, Sports turf, Sprigging, Stolon, Tall fescue, Thatch, Tiller, Transition zone, Transpiration, Turf, Turf grass, Turf-grass science and management, Turf quality, Utility turf, Vernation, Warm-season turf grasses, Winter over-seeding, Zoysia grass

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		**ACADEMIC AND WORKPLACE SKILLS** What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.1 Define turf terminology		Foundation	Writing	Adapts notes to proper form [1.6.1] Applies and uses technical words and concepts [1.6.4] Records data [1.6.16] Uses technical words and symbols [1.6.20] Writes appropriate entries [1.6.22] Writes legibly [1.6.24]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.2 List and compare the four types of turf and their functions		Foundation	Reading	Analyzes and applies what has been read to specific tasks [1.3.2] Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information, and applies it to task [1.3.8]
			Writing	Analyzes data, summarizes results, and makes conclusions [1.6.2] Communicates thoughts, ideas, or facts in written form in a clear concise manner [1.6.6]
1.3 Explain the two types of turf production		Foundation	Reading	Analyzes and applies what has been read to specific tasks [1.3.2] Comprehends written information for main ideas [1.3.7]
			Speaking	Applies/Uses technical terms as appropriate to audience [1.5.2]
			Writing	Analyzes data, summarizes results, and makes conclusions [1.6.2]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.4 Discuss career opportunities in the turf-grass industry		Foundation	Speaking	Applies/Uses technical terms as appropriate to audience [1.5.2]
		Personal Management	Career Awareness	Comprehends ideas and concepts related to turf-grass industry [3.1.3] Explores career opportunities [3.1.6]
1.5 Discuss the benefits of lawns		Foundation	Reading	Analyzes and applies what has been read to specific tasks [1.3.2] Comprehends written information for main ideas [1.3.7]
			Speaking	Applies/Uses technical terms as appropriate to audience [1.5.2]
			Writing	Analyzes data, summarizes results, and makes conclusions [1.6.2]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.6 Explain the practices used in maintaining a lawn	1.6.1 Locate two articles about lawn care from magazines, newsletters, or Internet publications 1.6.2 Create a price list of lawn-care products	Foundation	Arithmetic/ Mathematics Reading Science Speaking	Calculates dollar amounts [1.1.7] Analyzes and applies what has been read to specific tasks [1.3.2] Applies scientific principles related to turf management [1.4.5] Applies/Uses technical terms as appropriate to audience [1.5.2] Organizes ideas, and communicates oral messages to listeners [1.5.7]
1.7 Explore professional opportunities in lawn care	1.7.1 Visit the Web site www.plcaa.org	Foundation Personal Management	Speaking Career Awareness	Applies/Uses technical terms as appropriate to audience [1.5.2] Comprehends ideas and concepts related to turf-grass industry [3.1.3] Explores career opportunities [3.1.6]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.8 Identify and describe the major parts of a typical turf-grass plant		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information, and applies it to task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Science	Applies knowledge to complete a practical task [1.4.3]
			Writing	Applies and uses technical words and concepts [1.6.4] Records data [1.6.16]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.9 Describe the three growth habits of turf grasses	1.9.1 Draw the three growth habits of turf grasses	Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information, and applies it to task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Science	Applies knowledge to complete a practical task [1.4.3]
			Writing	Applies and uses technical words and concepts [1.6.4] Records data [1.6.16] Takes notes from various sources [1.6.18]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.10 List and describe the major factors affecting turf grass growth		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information, and applies it to task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Science	Applies knowledge to complete a practical task [1.4.3]
			Writing	Adapts notes to a proper form [1.6.1] Applies/Uses technical words and concepts [1.6.4] Records data [1.6.16] Writes logical and understandable sentences [1.6.23]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.11 Identify and describe cool- and warm-season turf grasses		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information, and applies it to task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Science	Applies knowledge to complete a practical task [1.4.3]
			Writing	Adapts notes to a proper form [1.6.1] Applies/Uses technical words and concepts [1.6.4] Records data [1.6.16] Writes logical and understandable sentences [1.6.23]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.12 Describe the characteristics of each of the cool-season turf grasses		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information, and applies it to task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Science	Applies knowledge to complete a practical task [1.4.3]
			Writing	Adapts notes to a proper form [1.6.1] Applies/Uses technical words and concepts [1.6.4] Takes notes from various sources [1.6.18]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.13 Explain how a lawn is established or renovated	1.13.1 Calculate a lawn area 1.13.2 Calculate the amount of seed or fertilizer a lawn would need 1.13.3 Use a rotary spreader 1.13.4 Use a drop spreader	Foundation	Arithmetic/ Mathematics	Applies a mathematical formula to solve a problem [1.1.3] Calculates different units of measurement [1.1.6] Calculates/Estimates quantities associated with establishing or renovating a lawn [1.1.8] Calculates percentages, ratios, proportions, decimals, and common fractions [1.1.10] Performs basic computations [1.1.31]
			Personal Management	Comprehends ideas and concepts related to lawn establishment or renovation [3.4.2] Exerts a high level of effort and perseverance toward goal attainment [3.4.4] Maintains a high level of concentration in completion of a task [3.4.7]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.14 Describe the types of fertilizers used on lawns		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information, and applies it to a task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Writing	Adapts notes to a proper form [1.6.1] Applies/Uses technical words and concepts [1.6.4] Takes notes from various sources [1.6.18] Writes logical and understandable sentences [1.6.23]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.15 List the nutrients required by turf grasses		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information, and applies it to task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Writing	Adapts notes to a proper form [1.6.1] Applies/Uses technical words and concepts [1.6.4] Takes notes from various sources [1.6.18]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.16 Describe the basic lawn fertilization process	1.16.1 Calibrate a rotary spreader 1.16.2 Collect a soil sample 1.16.3 Analyze soil sample for fertilizer needs	Foundation	Arithmetic/ Mathematics	Applies a mathematical formula to solve a problem [1.1.3] Calculates different units of measurement [1.1.6] Calculates/Estimates quantities associated with establishing or renovating a lawn [1.1.8] Calculates percentages, ratios, proportions, decimals, and common fractions [1.1.10] Performs basic computations [1.1.31
			Reading	Applies information and concepts derived from printed materials [1.3.3] Comprehends written specifications, and applies them to a task [1.3.9] Reads and follows instructions to operate technical equipment [1.3.19]
			Writing	Applies/Uses technical words and concepts [1.6.4] Takes notes from various sources [1.6.18]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.17 Discuss and explain thatch		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information, and applies it to task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Writing	Adapts notes to a proper form [1.6.1] Applies/Uses technical words and concepts [1.6.4] Takes notes from various sources [1.6.18]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Groups**	**Skill**	**Description**
1.18 Explain the factors that contribute to undesirable soil conditions		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information, and applies it to task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Writing	Applies/Uses technical words and concepts [1.6.4] Records data [1.6.16] Writes logical and understandable sentences [1.6.23]

Unit 2: Golf Course Management
20 Hours

Terminology: Aeration, Annual weeds, Apron, Assistant superintendent, Biennial weeds, Biological control, Biostimulants, Broadleaf weeds, Bunkers, Chemical mowing, Collar, Consultants, Coring, Creeping bent grass, Cup changing, Disease, Drainage, Educators and researchers, Endophyte, Fairway, Federal Insecticide, Fungicide, and Rodenticide Act, Fertigation, Fibrous root system, Fungicide, Fungus, Golf course, Golf course architects, Golf course builders, Golf course management crew, Golf course superintendent, Grain, Grass-like weeds, Grubs, Hazards, Herbicide, Hydrojet, Hyphae, Infection, Integrated Pest Management, Irrigation technician, Larva, Localized dry spots, Manufacturers, Mechanic, Nymph, O'clock pattern, Perennial weeds, Pesticide, Pesticide technician, Practice green, Professional writers, Putting green, Reel mower, Roughs, Sales representatives, Student interns, Support industries, Syringing, Tee, Topdressing, USGA, USGA specification, USGA stimpmeter, Weed, Wetting agents

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		**ACADEMIC AND WORKPLACE SKILLS** What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
2.1 Define golf course management terms		Foundation	Writing	Records data [1.6.16] Takes notes from various sources [1.6.18] Writes appropriate entries [1.6.22] Writes/Prints legibly [1.6.24]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
2.2 Discuss the major aspects of golf course management		Interpersonal	Leadership	Directs individuals in the performance of a specific task [2.4.5] Organizes group in planning and performing a specific task [2.4.9] Comprehends ideas and concepts related to golf course management [2.6.1]
			Teamwork	Recognizes effects of positive/negative attitudes on co-workers [2.6.4]
2.3 Describe the golf course maintenance industry	2.3.1 Research the industry (using the Web (www.gcsaa.org and www.usga.org)	Foundation	Writing	Analyzes data, summarizes results, and makes conclusions [1.6.2] Applies rules of grammar, punctuation, capitalization, and spelling [1.6.3] Composes and creates documents—letters, manuals, reports, proposals, graphs, flow charts, etc. [1.6.8]
		Thinking Skills	Knowing how to Learn	Locates appropriate learning resources to acquire or improve knowledge and skills [4.3.3]
2.4 Outline five jobs and their responsibilities in golf course management	2.4.1 Visit a golf course and interview the golf course maintenance crew	Personal Management Skills	Career Awareness, Development, and Mobility	Explores career opportunities [3.1.6]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
2.5 List the training areas required to be a qualified superintendent	2.5.1 Print out a job announcement for a golf course superintendent (using www.gcsaa.org or www.turfnet.com)	Personal Management	Organizational Effectiveness	Analyzes mission statement, work objectives, and implementation plans [3.3.3] Identifies characteristics [3.3.6] Presents personal skills as benefits for company objective [3.3.7]
2.6 Identify golf course support industries		Foundation	Reading	Uses written resources (book, dictionaries, and directories) to obtain factual information [1.3.23]
2.7 Outline career opportunities in the support industries		Personal Management	Career Awareness, Development, and Mobility	Explores career opportunities [3.1.6]
2.8 List the basic training requirements needed by a professional in a support industry		Personal Management	Career Awareness, Development, and Mobility	Identifies education and training needed to achieve goals [3.1.8]
2.9 Label the layers of the putting green structure		Foundation	Science	Applies knowledge to complete a practical task [1.4.3]
2.10 Describe the management requirements of putting greens, tees, and fairways		Foundation	Speaking Writing	Applies/Uses technical terms as appropriate to audience [1.5.2] Organizes information in an appropriate format [1.6.10]
2.11 List stressful conditions affecting putting greens		Foundation	Science Writing	Applies a scientific principle to solve a problem [1.4.7] Uses language, style, organization, and format appropriate to subject matter, purpose, and audience [1.6.19]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
2.12 Describe the functions of roughs, bunkers, and hazards		Foundation	Speaking	Communicates a thought, idea, or fact in spoken form [1.5.5]
			Writing	Communicates thoughts, ideas, or facts in written form in a clear, concise manner [1.6.6] Summarizes written information [1.6.17]
2.13 Outline the major management practices used for roughs, bunkers, and hazards		Foundation	Listening	Listens to follow directions [1.2.6]
2.14 List the mowing height ranges of greens, tees, and fairways		Foundation	Science	Applies scientific principles related to mowing height [1.4.5] Solves practical problems using scientific methods and techniques [1.4.22]
2.15 List key factors influencing mowing quality		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2]
		Thinking Skills	Decision Making	Evaluates information/data to make best decision [4.2.5]
2.16 Discuss the basic requirements of mowing greens		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2]
		Thinking Skills	Reasoning	Applies rules and principles to a new situation [4.5.1]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
2.17 Discuss chemical mowing		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2] Applies knowledge to complete a practical task [1.4.3] Follows safety guidelines [1.4.15] Measures dry and liquid supplies [1.4.16]
2.18 Compare the fertilization programs of greens, tees, fairways, and roughs		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2] Applies knowledge to complete a practical task [1.4.3] Measures dry and liquid supplies [1.4.16]
		Thinking Skills	Decision Making	Evaluates information/data to make best decision [4.2.5]
2.19 Explain how fertilizer requirements are determined		Foundation	Arithmetic/ Mathematics	Applies a mathematical formula to solve a problem [1.1.3] Interprets charts, tables, graphs, and working drawings [1.1.25] Performs basic computations [1.1.31]
		Thinking Skills	Decision Making	Evaluates information/data to make best decision [4.2.5]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
2.20 Discuss environmental issues in relation to fertilization		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2]
2.21 Compare the different watering requirements of turf grasses		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2] Solves practical problems using scientific methods and techniques [1.4.22]
2.22 Explain the use of plant-growth regulators		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2] Describes/Explains scientific principles related to plant-growth regulators [1.4.13]
2.23 Describe the functions of wetting agents		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2] Describes/Explains scientific principles related to plant growth regulators [1.4.13]
2.24 Identify turf grass diseases	2.24.1 Identify dollar spot, brown patch, pythium blight, snow mold, and spring dead spot	Foundation	Science	Describes/Explains scientific principles related to plant-growth regulators [1.4.13] Observes health code/sanitation requirements [1.4.18]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
2.25 Outline disease-control methods		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2] Applies a scientific principle to solve a problem [1.4.7] Follows safety guidelines [1.4.15] Observes health code/sanitation requirements [1.4.18]
2.26 Identify weed types		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2]
2.27 Describe basic weed control and herbicide usage		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2] Applies a scientific principle to solve a problem [1.4.7] Follows safety guidelines [1.4.15] Measures dry and liquid supplies [1.4.16]
		Thinking Skills	Problem Solving	Draws conclusions from observations, evaluates conditions, and gives possible solutions [4.4.5]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
2.28 Describe how insect pests attack turf grasses		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2] Describes/Explains scientific principles related to plant-growth regulators[1.4.13]
		Thinking Skills	Problem Solving	Draws conclusions from observations, evaluates conditions, and gives possible solutions [4.4.5]
2.29 Identify insect species that are serious pests of turf grasses	2.29.1 Draw the life cycle, and outline the characteristics of white grubs, cutworms, armyworms, chinch bugs, and mole crickets	Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information, and applies it to a task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Science	Applies knowledge to complete a practical task [1.4.3]
			Writing	Applies/Uses technical words and concepts [1.6.4] Records data [1.6.16] Takes notes from various sources [1.6.18]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
2.30 Explain how insects are controlled		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information, and applies it to a task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Writing	Applies/Uses technical words and concepts [1.6.4] Records data [1.6.16] Takes notes from various sources [1.6.18]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
2.31 List the components and importance of IPM		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information and applies it to a task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Science	Applies knowledge to complete a practical task [1.4.3]
			Writing	Applies/Uses technical words and concepts [1.6.4] Records data [1.6.16] Takes notes from various sources [1.6.18]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
2.32 List the type of pesticides used on golf courses		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information, and applies it to a task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Writing	Applies/Uses technical words and concepts [1.6.4] Records data [1.6.16] Takes notes from various sources [1.6.18]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
2.33 List the four regulations enforced by FIFRA		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information, and applies it to a task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Science	Applies knowledge to complete a practical task [1.4.3]
			Writing	Applies/Uses technical words and concepts [1.6.4] Records data [1.6.16] Takes notes from various sources [1.6.18]

Unit 3: Sports Turf
20 Hours

Terminology: Automatic level, Baseball/Softball field, Football field, Global Positioning Satellite, GPS receiver, Grade, Grade stakes, Leveling, Leveling rods, Plumb, Plumb bob, Regulation pitcher's mound, Skinned area, Slope, Soccer field, Sports field technician, 3-4-5 triangle, Waypoints

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		**ACADEMIC AND WORKPLACE SKILLS** What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
3.1 Define sports turf terms		Foundation	Writing	Applies/Uses technical words and concepts [1.6.4] Organizes information in an appropriate format [1.6.10] Writes logical and understandable sentences [1.6.23]
3.2 Identify the career opportunities in the sports turf industry		Personal Management	Career Awareness	Explores career opportunities [3.1.6] Identifies education and training needed to achieve goals [3.1.8]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
3.3 Describe the responsibilities of a sports-turf crew member	3.3.1 Research training requirements for a sports-turf professional 3.3.2 Use the Web site: www.greenindustry.com	Interpersonal	Cultural Diversity Leadership	Comprehends ideas and concepts related to requirements for a sports-turf professional [2.2.1] Works effectively with men and women from diverse backgrounds –ethnic, social, educational, etc. [2.2.5] Comprehends ideas and concepts related to requirements for a sports turf professional [2.4.2] Conveys attitudes and values of group to others [2.4.3]
3.4 Identify the main types of sports fields		Foundation	Writing	Analyzes data, summarizes results, and makes conclusions [1.6.2] Evaluates written information for appropriateness/content/clarity [1.6.9]
3.5 Explain the critical features in sports-field management		Interpersonal	Leadership	Comprehends ideas and concepts related to sports-field management[2.4.2] Encourages/Motivates members of a group or team [2.4.6]
3.6 Describe the dimensions of a football field, baseball field, and soccer field		Foundation	Speaking Writing	Applies/Uses technical terns as appropriate to audience [1.5.2] Applies/Uses technical words and concepts [1.6.4]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
3.7 Identify major turf grasses used for sports fields		Foundation	Writing	Applies/Uses technical words and concepts [1.6.4] Communicates thoughts, ideas, or facts in written form in a clear, concise manner [1.6.6]
3.8 Describe the major characteristics of each sports turf grass		Foundation	Writing	Applies/Uses technical words and concepts [1.6.4] Communicates thoughts, ideas, or facts in written form in a clear, concise manner [1.6.6]
3.9 Identify surveying equipment		Foundation	Speaking	Adapts presentation to audience [1.5.1] Applies/Uses technical terms as appropriate to audience [1.5.2]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
3.10 Explain the process of layout and flagging a course to survey, using traditional methods	3.10.1 Set up a tripod 3.10.2 Mount a survey instrument 3.10.3 Level the instrument 3.10.4 Read a leveling rod, using the surveying instrument 3.10.5 Layout and flag a course to survey	Foundation	Science	Applies knowledge to complete a practical task [1.4.3] Applies scientific principles related to survey, using traditional methods [1.4.5] Uses equipment and techniques to survey, using traditional methods [1.4.23]
		Thinking Skills	Problem Solving	Comprehends ideas and concepts related to traditional surveying methods [4.4.1] Devises and implements a plan of action to resolve problem [4.4.3]
3.11 Explain the process of layout and flagging a course to survey, using GPS technology	3.11.1 Layout and flag a course to survey, using GPS technology	Foundation	Science	Applies knowledge to complete a practical task [1.4.3] Applies scientific principles related to survey, using GPS technology [1.4.5] Uses equipment and techniques to survey, using GPS technology [1.4.23]
		Thinking Skills	Problem Solving	Comprehends ideas and concepts related to GPS technology [4.4.1] Devises and implements a plan of action to resolve problem [4.4.3]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
3.12 Cite the dimensions of a high school soccer field, football field, and baseball field	3.12.1 Measure a high school or area athletic field 3.12.2 Verify local athletic field sizes using GPS technology	Foundation	Science	Applies knowledge to complete a practical task [1.4.3] Applies scientific principles related to layout a sports field [1.4.5] Uses equipment and techniques to lay out a sports field [1.4.23]
		Thinking Skills	Problem Solving	Comprehends ideas and concepts related to sports fields [4.4.1] Devises and implements a plan of action to resolve problem [4.4.3]

Unit 4: Turf Irrigation
10 Hours

Terminology: Application rate, Bubbler, Controller, Design capacity, Flow, Gallons per minute (GPM), Head-to-head, Installed irrigation system, Irrigation, Lateral lines, Main supply line, Point of connection, Pop-up sprinklers, Pressure, Radius of throw, Rotors, Slope, Spray heads, Sprinklers, Station, Uniformity

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		**ACADEMIC AND WORKPLACE SKILLS** What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
4.1 Define irrigation terms		Foundation	Writing	Applies/Uses technical words and concepts [1.6.4] Organizes information into an appropriate format [1.6.10] Writes logical and understandable sentences [1.6.23]
4.2 Compare irrigation systems		Foundation	Speaking	Communicates a thought, idea, or fact in spoken form [1.5.5] Organizes ideas, and communicates oral messages to listeners [1.5.7]
			Writing	Applies/Uses technical words and concepts [1.6.4] Organizes information into an appropriate format [1.6.10]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
4.3 Determine the type and number of sprinklers necessary to irrigate an area	4.3.1 Go to site: www.rainbird.com	Foundation	Science	Acquires and processes scientific data [1.4.1] Applies knowledge to complete a practical task [1.4.3] Applies scientific principles related to sprinkler irrigation [1.4.5]
4.4 List the major components of a golf course irrigation system		Foundation	Writing	Applies/Uses technical words and concepts [1.6.4] Organizes information in an appropriate format [1.6.10] Writes logical and understandable sentences [1.6.23]
4.5 List the key factors influencing irrigation quality		Foundation	Writing	Applies/Uses technical words and concepts [1.6.4] Organizes information in an appropriate format [1.6.10] Writes logical and understandable sentences [1.6.23]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
4.6 Map out an irrigation plan	4.6.1 Sketch a two-dimensional layout of a property 4.6.2 Measure items for a plan (including beds, trees, shrubs, buildings, driveways, etc.) 4.6.3 Sketch an accurate irrigation plan	Foundation	Arithmetic/ Mathematics Science	Draws to scale [1.1.20] Interprets charts, tables, graphs, and working drawings [1.1.25] Makes precision measurements using appropriate instruments [1.1.27] Reads measurements from common measuring devices [1.4.20]
4.7 List the questions utility companies and municipal authorities should be asked regarding home irrigation installation	4.7.1 Visit a site, and determine flow rate of the water system, pressure of the water system, location of the water meter, and slope of the property 4.7.2 1-800-482-8998	Foundation	Arithmetic/ Mathematics	Applies a mathematical formula to solve a problem [1.1.3] Applies computation skills to home irrigation installation [1.1.5] Comprehends the role of chance in the occurrence and prediction of events [1.1.13] Draws to scale [1.1.20]

Unit 5: Equipment & Maintenance
15 Hours

Terminology: Agitator, Air-cooled engine, Bed knife, Boom sprayer, Calibrate, Carburetor, Combustion, Connecting rod, Crankshaft, Cylinder head, Discharge mower deck, Engine block, Environmental Protection Agency (EPA), Flywheel, Fuel injector, Gallons Per Acre (GPA), Governor, Ground-driven reel, Hydraulic-driven reel, Injection pump, Internal-combustion engine, Mower operator, Multicylinder, Nozzle, Octane, Operator, Piston, Piston rings, Pressure gauge, Pump, Reel, Regulator valve, Valves

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		**ACADEMIC AND WORKPLACE SKILLS** What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
5.1 Define equipment and maintenance terms		Foundation	Writing	Adapts notes to proper form [1.6.1] Applies rules of grammar, punctuation, capitalization, and spelling [1.6.3]
5.2 Identify the basic components of small engines used on golf course equipment		Foundation	Science	Applies knowledge to complete a practical task [1.4.3]
5.3 Differentiate between the component functions of two- and four-cycle engines		Foundation	Science	Applies knowledge to complete a practical task [1.4.3]
5.4 List maintenance procedures recommended for small engines		Foundation	Science	Applies knowledge to complete a practical task [1.4.3]
5.5 Identify the components of diesel engines used on golf course equipment		Foundation	Science	Applies knowledge to complete a practical task [1.4.3]
5.6 Identify maintenance procedures recommended for diesel engines		Foundation	Science	Applies knowledge to complete a practical task [1.4.3]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
5.7 Discuss the differences between fuels and lubricants used in diesel and gasoline engines		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2] Applies knowledge to complete a practical task [1.4.3]
5.8 Identify the types of reel mowers used on golf courses		Foundation	Writing	Adapts notes to proper form [1.6.1] Applies rules of grammar, punctuation, capitalization, and spelling [1.6.3]
5.9 Describe safety practices used on or with reel-type mowers		Foundation	Writing	Adapts notes to proper form [1.6.1] Applies rules of grammar, punctuation, capitalization, and spelling [1.6.3]
5.10 List the proper maintenance procedures used when operating a reel-type mower	5.10.1 Adjust the reel to bed-knife setting	Foundation	Writing	Adapts notes to a proper form [1.6.1] Applies/Uses technical words and concepts [1.6.4]
5.11 Identify the various types of rotary mowers and where they are used on the golf course		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2]
5.12 Describe the safety practices used on or with rotary mowers		Foundation	Writing	Adapts notes to a proper form [1.6.1] Applies/Uses technical words and concepts [1.6.4]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
5.13 List the maintenance procedures used on or with rotary mowers		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2] Applies knowledge to complete a practical task [1.4.3] Applies scientific principles related to maintenance of rotary mowers [1.4.5]
5.14 Identify the components of a boom sprayer		Foundation	Writing	Adapts notes to proper form [1.6.1] Applies rules of grammar, punctuation, capitalization, and spelling [1.6.3] Applies/Uses technical words and concepts [1.6.4]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
5.15 Discuss the process of calibrating a boom sprayer	5.15.1 Calibrate a boom sprayer	Foundation	Arithmetic/ Mathematics	Applies addition, subtraction, multiplication, and division to real-world situations [1.1.1] Applies a mathematical formula to solve a problem [1.1.3] Calculates different units of measurement [1.1.6] Calculates measurements taken from measuring devices [1.1.9] Chooses appropriately from a variety of mathematical techniques [1.1.11] Comprehends mathematical ideas and concepts related to calibrating a boom sprayer [1.1.13] Computes, using a formula [1.1.14] Demonstrates mathematical calculation [1.1.19] Performs basic computations [1.1.31]
5.16 List the safety practices used with a boom sprayer		Foundation	Writing	Adapts notes to proper form [1.6.1] Applies rules of grammar,

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
				punctuation, capitalization, and spelling [1.6.3]
5.17 Explain the maintenance procedure used on boom sprayers		Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2]
5.18 Identify tools used on maintenance of equipment	5.18.1 Use tools for maintenance exercises	Foundation	Writing	Adapts notes to proper form [1.6.1] Applies rules of grammar, punctuation, capitalization, and spelling [1.6.3] Applies/Uses technical words and concepts [1.6.4]
5.19 Perform maintenance activities associated with equipment	5.19.1 Change the oil in a lawn mower or small gas engine 5.19.2 Service the air cleaner 5.19.3 Clean a fuel tank and line 5.19.4 Clean carburetor float bowl 5.19.5 Replace the spark plug 5.19.6 Clean engine of all dirt and debris 5.19.7 Remove and sharpen the mower blades 5.19.8 Examine engine for loosened bolts or other parts and retighten	Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management)[1.4.2] Applies knowledge to complete a practical task [1.4.3] Applies scientific principles related to maintenance of rotary mowers[1.4.5]

Unit 6: Human Resources & Financial Management
5 Hours

Terminology: Benefits, Budget, Communication, Depreciation costs, Employee recruiting, Equipment costs, Financial management, Job interviewing, Labor costs, Maintenance costs, Networking, Purchase order, Record, Renovation costs, Revenue, Salary, Turf manager, Wage

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		**ACADEMIC AND WORKPLACE SKILLS** What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
6.1 Define human resource and financial management terms		Interpersonal	Leadership	Conveys attitudes and values of group to others [2.4.3] Delegates responsibility to an individual within the group or team [2.4.4]
6.2 List the main aspects of human resource management in a golf course operation	6.2.1 Write a job announcement for an opening on a golf course	Interpersonal	Teamwork	Comprehends ideas and concepts related to human resource management [2.6.1] Demonstrates understanding, friendliness, adaptability, empathy, and politeness in new and ongoing group settings [2.6.3] Recognizes effects of positive/negative attitudes on co-workers [2.6.4]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
6.3 Explain challenging areas in people management		Interpersonal	Negotiation	Assists in reaching a settlement/conclusion through compromise [2.5.1] Comprehends ideas and concepts related to people management [2.5.2] Works to resolve conflict between two or more individuals [2.5.3]
6.4 Describe the types of records kept by a turf manager		Foundation	Arithmetic/ Mathematics	Applies addition, subtraction, multiplication, and division to real-world situations [1.1.1] Calculates dollar amounts [1.1.7] Calculates percentages, ratios, proportions, decimals, and common fractions [1.1.10] Performs basic computations [1.1.31] Uses basic numerical concepts in practical situations [1.1.32]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
6.5 Explain how to prepare a budget	6.5.1 Prepare a budget 6.5.2 Use a computer while preparing a financial-management plan	Foundation	Arithmetic/ Mathematics	Applies addition, subtraction, and division to real-world situations [1.1.1] Applies mathematical principles related to a budget [1.1.4] Applies computation skills to a budget [1.1.5] Calculates dollar amounts [1.1.7]
6.6 Identify the major expenses in golf course management		Foundation	Arithmetic/ Mathematics	Calculates dollar amounts [1.1.7] Calculates/Estimates golf course management expenses [1.1.8] Calculates measurements taken from measuring devices [1.1.9]
6.7 Describe the steps in a purchase process		Foundation	Arithmetic/ Mathematics	Calculates different units of measurement [1.1.6] Calculates percentages, ratios, proportions, decimals, and common fractions [1.1.10] Demonstrates mathematical calculation [1.1.19] Expresses mathematical ideas and concepts orally and in writing [1.1.23]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
6.8 Explain how golf course superintendents can save money		Foundation	Arithmetic/ Mathematics	Computes using a formula [1.1.14] Performs basic computations [1.1.31] Adds and multiplies to prepare an inventory [1.1.40] Adds and subtracts to determine inventory [1.1.41] Calculates and compares shipping costs [1.1.45]
6.9 Explain the factors that lead to acquiring a job	6.9.1 Prepare for a job interview 6.9.2 Write a resume 6.9.3 Write a cover letter 6.9.4 Conduct a successful interview	Personal Management	Career Awareness Organizational Effectiveness Responsibility	Explores career opportunities [3.1.6] Identifies education and training needed to achieve goals [3.1.8] Sets well-defined and realistic personal/career goals (short-term and long-term) [3.1.11] Presents personal skills as benefits for company objective [3.3.7] Accepts responsibility for position [3.4.1]

Glossary

Unit 1: Lawn Care & Turf Production

1. Auricle—a pair of tiny appendages between the leaf blade and sheath

2. Bahia grass (*Paspalum notatum*)—a coarse-textured grass that is adapted to mild coastal climates and used for low quality and maintenance turf

3. Bermuda grass (*Cynodon spp*.)—a group of the most popular warm-season turf grasses, includes several species and hybrids, which are used in the warmer regions for all levels of turf from putting greens to low-quality turf

4. Bunch-type—a type of growth habit with tillers as new shoots; includes tall fescue and perennial ryegrass

5. Centipede grass (*Eremochloa ophiuroides*)—a grass that has a medium-coarse texture with light green color and slow growth habit; tolerates shade but not traffic or wear

6. Collar—a light-colored band between the leaf blade and sheath on the lower side of the leaf

7. Cool-season turf grasses—turf grasses that can only adapt in the cooler regions with the best temperature range from 65 F to 80 F; generally have better growth during the spring and fall seasons

8. Crown—the major growing area of a grass located at the base of the grass near the soil surface; also called the compacted stem of a grass

9. Cultivar (varieties)—a subdivision used to describe different grasses within the same species

10. Cultivation—working of the soil without destroying the turf

11. Dethatch—any method used to reduce the thatch layer of a lawn

12. Drop spreader—a type of spreader that is used to spread seeds or granular materials

13. Embryo—the part of a seed that develops into a young plant

14. Endosperm—the part of a seed that stores food for seed germination

15. Essential nutrient elements—16 essential elements needed by plants including turf grasses; three are from air and water: carbon (C), oxygen (O), and hydrogen (H); plants are not fertilized with these three elements because they are rarely short of these three. The other 13 elements are mainly from soils, and any of them can become deficient depending on the soil condition and the quantities needed by plants. Based on the quantity used by plants and the frequency of deficiency from the soil, the 13 elements are divided into primary nutrients: nitrogen (N), phosphorus (P), and potassium (K); secondary nutrients: calcium (Ca), magnesium (Mg), and sulfur (S); and micronutrients: iron (Fe), zinc (Zn), copper (Cu), manganese (Mn), molybdenum (Mo), boron (B), and chlorine (Cl). A plant cannot grow properly without any one of these 16 essential elements.

16. Evaporation—the process of water losses from a water body or a surface

17. Evapotranspiration—the combination of evaporation and transpiration; described as a layer of water lost from a planted area in millimeters (mm)

18. Fertilizer—a material containing one or more essential nutrients; can be safely used to grow plants; can be in granular or liquid form

19. Fertilizer analysis—the percentage by weight given on the fertilizer bag: e.g., a 23-7-7 fertilizer contains 23% nitrogen, 7% phosphorus (P_2O_5), and 7% potassium (K_2O)

20. Fine fescues (*Festuca spp.*)—a medium-textured, bunch-type turf grass commonly used in cold and cool zones

21. Germination—the start of new seedlings; requires proper moisture, temperature, oxygen, and nutrient conditions

22. Growth habit—the growing pattern by which a turf grass spreads itself; three types include stoloniferous, rhizomatous, and bunch-type

23. Inflorescence—the flowers of a plant where seeds are developed; also called seed head

24. Inorganic fertilizer—a fertilizer made of inorganic salts, such as potassium nitrate (KNO_3), with a quick release rate

25. Kentucky bluegrass *(Poa pratensis*)—a medium leaf texture, rhizomatous grass most commonly used as lawn turf grass in cold or cool zones

26. Lawn—a type of maintained turf that surrounds a residential house or a public building

27. Lawn-care service owner—a trained individual who runs a lawn-care business and service

28. Lawn-care technician—a trained individual who provides mowing, fertilization, and pest control treatments to lawns and follow-up customer service to a territory route of several dozens to hundreds of homeowners

29. Leaf blade—the upper portion of a grass leaf

30. Leaf sheath—the lower portion of a grass leaf

31. Ligule—a membranous or hairy structure on the inside of a leaf at the junction of the leaf blade and sheath

32. Mulching—any material used to cover a newly established or renovated turf; usually straw

33. Organic fertilizer—a fertilizer from natural organic materials, such as animal manure, dead plant and animal materials, sewage sludge, bone meal, and blood meal, or from synthetic organic materials, such as urea, sulfur-coated urea, and other urea-containing materials; except urea, organic fertilizers are slow release

34. Perennial ryegrass (*Lolium perenne*)—a medium-textured, bunch-type turf grass commonly used in cold and cool zones

35. pH—the measurement of the acidity or alkalinity of a soil; 7.0 is neutral; below 7.0 is acidic; above 7.0 is alkaline

36. Plugging—a method of establishing a new turf using turf plugs harvested from a mature turf

37. Primary root—the first root from a germinating seed

38. Professional lawn care—an industry that specializes in lawn care and directly provides lawn care service to homeowners; it has an annual revenue of $25 billion in the United States and has grown rapidly in the past 20 years

39. Renovation—a practice of improving a poor turf

40. Rhizome—a spreading stem that grows underground and produces new shoots and roots at the nodes

41. Rotary mower—a mower that cuts grass leaves by the impact of a rapidly rotating blade

42. Rotary spreader—a type of spreader used for broadcast application of seeds and fertilizers

43. St. Augustine grass (*Stenotaphrum secundatum*)—a coarse-textured, shade-tolerant, fast growing grass; this salt-tolerant grass does well in coastal areas but is rarely available by seed

44. Scalping—excessive removing of green leaves resulting in a brown appearance by exposing dead leaves or even bare soil; main cause is lower mowing height or uneven turf surface

45. Secondary roots—the lateral roots from the crown region

46. Seed—a ripened ovule with the potential to germinate a new plant

47. Seedbed—a site prepared for starting a new turf

48. Seed coat—the outside protective layer of a seed

49. Seed quality—a term used to describe the germination rate (based on 100 seeds) and the purity of the seeds

50. Seed spreader—a tool used to apply seed; two kinds of seed spreaders commonly used: rotary spreader and drop spreader

51. Shoot—an upright unit of a turf grass, including several leaves and a growing point in the base; a turf-grass plant may have many shoots. Without mowing, each shoot has a potential to produce a seed head. After producing a seed head, the shoot finishes its function and dies. The death of a single shoot would not affect the plant, which has multiple shoots.

52. Sod—a harvested turf grass unit in a thin layer with soil and roots intact; used for new turf establishment

53. Soil analysis—a printout of the results of a soil test, which includes soil pH, organic matter %, component %, as well as levels of available nutrients

54. Soil profile—a vertical view of the soil layers; usually obtained by using a probe

55. Sports turf—a type of turf that is maintained as the cover of a sports field to protect athletes and reduce the damage to the field

56. Sprigging—a method to use pieces of stolons cut from a mature turf to start a new turf; these pieces are called sprigs, which usually are planted in furrows

57. Stolon—a spreading stem that grows along the surface of the ground and produces new shoots and roots at the nodes

58. Tall fescue (*Festuca arundiacea*)—a coarse-textured, bunch-type turf grass commonly used in cold, cool, or transition zones

59. Thatch—the accumulation of dead roots and stems, mostly at soil surface or immediately above

60. Tiller—a stem that develops from the crown of the parent plant and grows upward within the enclosing leaf sheath of the parent plant

61. Transition zone—the zone between the warm-season and cool-season zones where both warm- and cool-season grasses can be grown but where the climate is not optimal for either

62. Transpiration—water losses through a plant body; cools off the body temperature of a plant; on average during a hot summer day, a plant can loss 90% of the water it has absorbed

63. Turf—the general name for an area covered with maintained turf grass

64. Turf grass—a type of grass with spreading growth habit and tolerance to mowing and traffic; most are perennials

65. Turf grass science and management—the science, art, and business of cultivating turf grasses for various purposes

66. Turf quality—the appearance and function of a turf; evaluated by color, smoothness, density of shoots, leaf texture, uniformity, growth habit, pest resistance, playing conditions, and recovery rate after damage

67. Utility turf—a type of turf, such as highway and airport turf, that is used to reduce soil erosion and protect the environment

68. Vernation—the arrangement of the youngest leaf in the bud shoot, either folded or rolled

69. Warm-season turf grasses—one of the two major groups of turf grasses; can grow well during the summer season at a temperature range of 80 F to 95 F and go to dormancy during the winter season when the temperature is below 32 F. The other group of turf grasses is called cool-season turf grasses, which can grow well in a temperature range from 65 F to 80 F.

70. Winter over-seeding—a practice used in the southern regions during winter; a cool-season turf grass is seeded on a warm-season turf grass in the late fall when the warm-season grass starts to go dormant. The winter over-seeded turf grass only lasts for one winter, and it will die out the next spring when warm-season turf grass starts to grow. The most common cool-season turf grass used for winter over-seeding is perennial ryegrass.

71. Zoysia grass (*Zoysia japonica*)—a dense, hardy turf that endures both high temperatures and humidity; tolerates low maintenance, although it is slow-growing with a long winter dormancy period; improved seed varieties available; very winter hardy

Unit 2: Golf Course Management

1. Aeration—a practice used to improve soil conditions by removing soil cores or slicing the soil without destroying the lawn; methods include coring, slicing, vertical cutting, and dethatching

2. Annual weeds—weeds, such as crabgrass and common chickweed, that finish a life cycle within a year

3. Apron—the front area between a green and the fairway

4. Assistant superintendent—an assistant to a superintendent who serves as superintendent when the superintendent is absent; this position usually attracts a recent college graduate majoring in golf course management or related areas with experience in golf course management

5. Biennial weeds—weeds, such as bull thistle and wild carrot, that finish a life cycle within two years

6. Biological control—use of one organism to control another pest

7. Biostimulants—plant-growth promoters extracted from other living organisms containing one or more types of plant hormones

8. Broadleaf weeds—dicotyledonous weeds, such as plantains and clovers

9. Bunkers—a hazard consisting of a depression area of bare ground usually covered with sand

10. Chemical mowing—using chemicals (plant-growth regulators) to reduce the growth of turf grasses to reduce the frequency of mechanical mowing without compromising the turf quality

11. Collar—the zone surrounding the green, ranging from two feet to several feet wide; its mowing height is a little higher than the putting green

12. Consultants—people who provide technical information and advice on golf course management

13. Coring—a method of turf cultivation in which soil cores are removed by hollow tines

14. Creeping bent grass—the most important cool-season turf grass for golf courses in the northern climates; can be used on putting greens, tees, and fairways in northern climates and the transition zone

15. Cup changing—a daily routine to change the location of the ball cup following certain patterns (to be uniformly used for the 18 holes: all cups on the front of the green, back of the green, or so on)

16. Disease—an abnormal, unhealthy disorder of a plant caused by either a pathogen or an unfavorable condition

17. Drainage—the means of getting rid of excessive water on golf courses

18. Educators and researchers—people who conduct research and education to support the golf industry

19. Endophyte—a plant living within another plant

20. Fairway—the area between tees and the green with a mowing height of ¼ to 1 inch, depending on turf grass species and cultivars

21. Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)—in general, allows a state to regulate the sale or use of any federally registered pesticide or device in the state, but only if and to the extent the regulation does not permit the sale or distribution of the federally registered pesticide allowed under this act. Uniformity: Such state shall not impose or continue in effect any requirements for labeling or packaging in addition to or different from those required under this Act. For more information, conduct an Internet search for FIFRA.

22. Fertigation—applying fertilizers with the irrigation water

23. Fibrous root system—a root system without a main root; all grasses have a fibrous root system

24. Fungicide—a pesticide used to control a disease caused by fungi

25. Fungus—a type of microorganism producing mycelium and spores without chlorophyll; most turf grass diseases are caused by fungi, which feed on turf grasses

26. Golf course—a site for golf with various holes covered by all levels of maintained turf, including putting greens, tees, fairways, and roughs

27. Golf course architects—people who design golf courses, including some professional golfers

28. Golf course builders—people who build or renovate golf courses

29. Golf course management crew—a team of three to several dozens of people with special training to maintain a golf course, including mowing, irrigating, fertilizing, pest control, ground maintenance, tournament preparation, and other aspects to maintain the golf course's playability

30. Golf course superintendent—the supervisor and leader of the golf course management crew; usually required to have a college degree or training in golf course management, turf grass management, or related areas; skills in financial management and human resource management are also necessary. It usually takes a person two to three years of experience as an assistant superintendent before he or she can become a superintendent.

31. Grain—turf grass leaves all lie in one direction due to multiple mowing passes in the same direction

32. Grass-like weeds—weeds, such as wild garlic and nut sedges, that are not grasses but look like grasses

33. Grubs—a soft, thick, wormlike larva of an insect

34. Hazards—any bunker or water hazard

35. Herbicide—a type of pesticide used to kill weeds

36. Hydrojet—a method using high pressure (5,000 psi) water injection into the turf to loosen soil compaction without producing soil cores and destruction of the playability

37. Hyphae—the threadlike filaments of the fungus body

38. Infection—the invasion and establishment of a disease-causing microorganism (pathogen) within a plant

39. Integrated Pest Management or Intelligent Plant Management (IPM)—combining methods to control pests, such as resistant plant varieties, chemical and biological pesticides, pest exclusion, and plant health management

40. Irrigation technician—a trained specialist responsible for maintenance of the irrigation systems on a golf course

41. Larva—the immature, wingless, and often wormlike feeding form that hatches from the egg of many insects; alters chiefly in size while passing through several molts, and is finally transformed into a pupa or chrysalis from which the adult emerges

42. Localized dry spots—a dry spot of turf that resists rewetting by normal irrigation and rainfall; can be associated with thick thatch, fungal activity, and other poor soil conditions; occurs often on putting greens

43. Manufacturers—companies that produce golf course maintenance-related products, such as tools, equipment, and chemicals

44. Mechanic—a trained specialist responsible for repairing and maintaining equipment, including mowers, sprayers, and related machines

45. Nymph—any of various immature insects; *especially* a larva of an insect (e.g., a grasshopper, true bug, or mayfly) with incomplete metamorphosis that differs from the imago especially in size and in its incompletely developed wings and genitalia

46. O'clock pattern—mowing directions to follow; 12 – 6 o'clock is set as the direction from tee to the green

47. Perennial weeds—weeds that can live many years

48. Pesticide—an agent used to destroy pests

49. Pesticide technician—a trained specialist responsible for pest management and application of pesticides with a pesticide license

50. Practice green—the green area of a golf course used for practice of putting; usually near the club house

51. Professional writers—people who write professional articles for magazines, newsletters, and Internet publications

52. Putting green—the area to putt the ball into a hole; the area on a golf course with the lowest mowing height (between 1/10 to 2/16 of an inch) and a smooth surface due to the ball speed requirement

53. Reel mower—a mower that has a rotating reel with blades, which cut against a stationary bed knife

54. Roughs—the areas that are covered with turf grasses and surround the putting green, fairway, and tees and provide the background on which the game is played

55. Sales representatives—people who sell products to golf courses, including fertilizers, pesticides, equipment, and irrigation supplies

56. Student interns—college students, majoring in golf course management or related areas, working on a golf course to meet course credit requirements for their college degree

57. Support industries—any industries that are related to the establishment and maintenance of a turf, such as the fertilizer industry, pesticide industry, equipment industry, or irrigation industry

58. Syringing—a light irrigation during a summer day to cool off the turf surface

59. Tee—the area to start a hole; mowed at 3/8 to 3/4 of an inch, depending on turf grass species and cultivars

60. Topdressing—spreading a thin layer of soil mix or sand over a turf area, and working it into the turf to stimulate thatch decomposition and smooth the surface

61. USGA—the United States Golf Association; founded in 1984

62. USGA specification—a commonly used construction model to enhance the putting green quality; includes a 12- to 14-inch root mix zone with sand and peat moss mixture (by volume: 80-90% sand; 10-20% peat moss), a coarse sand zone of 2 to 4 inches, and a pea gravel zone and course gravel zone; a subdrainage system is underneath these layers

63. USGA stimpmeter—an instrument to measure ball speed in feet and inches; the desired ball speed range is between 9-11 feet.

64. Weed—a plant growing in a wrong place

65. Wetting agents—materials applied to a turf to enhance water use by turf grass

Unit 3: Sports Turf

1. Automatic level—introduced in this country in 1948 by the Zeiss Company of West Germany, a tool used most often to determine elevations and set up level points over long distances; adjusts more quickly than traditional levels and has a high degree of accuracy

2. Baseball/Softball field—a field that occupies an area between 1.4 to 4.5 acres; normally covered with turf and special clay on the skinned areas

3. Football field—a field 300 feet by 165 feet for the game of football; normally covered with turf

4. Global Positioning Satellite (GPS)—a navigational system using satellite signals to fix the location of a receiver on or above the Earth's surface

5. GPS receiver—a receiver used to receive satellite signals to fix the location on or above the Earth's surface

6. Grade—the degree of inclination of a road or slope

7. Grade stakes—stakes used to mark the inclination of a road or slope

8. Leveling—a process used to determine the difference in elevation on a particular piece of land; clearly shows any high or low spots on the field

9. Leveling rods—can be made of wood, fiberglass, plastic, or aluminum; designed to be used with the auto level and other leveling instruments; most have adjustable sections; the numbers and graduation marks are large so they can be easily read; the engineer's rod is graduated in feet, tenths of a foot, and hundredths of a foot

10. Plumb—an exact vertical and perpendicular line; it would be at a 90-degree angle to a level plane (the field)

11. Plumb bob—a tool used to test or establish vertical lines; based on the fact that when a weight is suspended from a line, it will cause the line to fall vertically (90 degrees) to a horizontal; the common plumb bob is ground and polished to a point on the lower end; the top is provided with a screw on cap through which a line is passed; the line is used to suspend the plumb bob under the leveling instrument

12. Regulation pitcher's mound—the diameter of a pitcher's mound clay is 18 feet with 10 feet from the front of the rubber, toward home plate, and 8 feet from the back of the rubber; a regulation pitcher's mound is 10½ inches high (compared to the surface level of home plate)

13. Skinned area—the bare ground area of a baseball field

14. Slope—refers to the incline or difference in elevation from one part of the property to the other

15. Soccer field--a field 300-360 feet by 160-225 feet for the game of soccer; normally covered with turf

16. Sports field technician—a technician responsible for the maintenance of sports fields

17. 3-4-5 triangle—a direct application of the Pythagorean theorem; to lay out a square corner, locate a point and measure 30 feet down one side of the field and 40 feet down the other side from that corner; then measure the diagonal distance between the end of the 30-foot line and the end of the 40-foot line; if the diagonal is 50 feet, the corner is square

18. Waypoints—coordinates on a GPS map or route thath can be used for various uses, such as maps, trails, layout of fields, etc.

Unit 4: Turf Irrigation

1. Application rate—the rate at which water is applied to turf or ornamental plantings; the amount of water applied to a given area in an hour
2. Bubbler—a water emission device that applies water to the soil surface using an umbrella-type pattern
3. Controller—also known as a timer, the part of an automatic sprinkler system that determines when a valve will turn on and how long it will operate
4. Design capacity—measured in gallons per minute (GPM); the maximum amount of water available for use in an irrigation system
5. Flow—the movement of fluids through pipes, fittings, and valves
6. Gallons per minute (GPM)—a standard measurement of water flow
7. Head-to-head—the placement of sprinkler heads so one sprinkler will spray another sprinkler (or 50% of the adjusted diameter)
8. Installed irrigation system—a network of underground pipes and pop-up sprinklers controlled by manual or automatic valves that supplies water to a playing field or other designated areas
9. Irrigation—the process of supplying water to a stand of turf grass or other plant culture
10. Lateral lines—nonpressure pipes that connect valves to sprinkler heads
11. Main supply line—the only line on the field that has continual water pressure and supplies water to all lateral lines
12. Point of connection—location where the irrigation system is connected to the main water system
13. Pop-up sprinklers—sprinkler heads that are part of a permanent sprinkler system; the heads “pop up” when the water is turned on to distribute water and drop back to soil level when the water is turned off
14. Pressure—measured with a pressure gauge and expressed in pounds per square inch (PSI); the amount of energy available to move water through pipe, valves, sprinklers, or other components of the irrigation system
15. Radius of throw—the distance from the sprinkler head to the farthest point of water application
16. Rotors—gear-driven sprinklers that spray a solid stream of water and rotate slowly in a circular pattern, applying water to areas as large as 75 feet or more

17. Slope—refers to the incline or difference in elevation from one part of the property to the other

18. Spray heads—sprinklers that emit a fan-type spray of small droplets of water

19. Sprinklers—devices that throw water through the air, usually in a circular pattern, for a predetermined distance

20. Station—a circuit on an irrigation controller that can be programmed with a run time separate from other circuits; provides power to one or more remote control valves

21. Uniformity—the evenness of precipitation over a given area

Unit 5: Equipment & Maintenance

1. Agitator—keeps the water and pesticide in motion so the concentration of pesticide is uniformly mixed with the carrier at all times
2. Air-cooled engine—an engine that circulates air around the cylinder block and cylinder head to maintain the desired engine temperature
3. Bed knife—a stationary blade of tempered steel that forms a shearing action with the rotating reel
4. Boom sprayer—a mechanically driven device equipped with spray nozzles and a holding tank used to apply a pressurized liquid evenly over the turf
5. Calibrate—to adjust the mix of pesticide and carrier with the speed and pressure of the boom sprayer so the correct amount of pesticide is applied
6. Carburetor—properly mixes filtered air with fuel
7. Combustion—the rapid, oxidizing chemical reaction in which a fuel chemically combines with oxygen in the atmosphere and releases energy in the form of heat
8. Connecting rod—connects the piston to the crankshaft
9. Crankshaft—connected to the piston by a connecting rod; converts up-and-down motion to rotary motion
10. Cylinder head—provides a seal for one end of the cylinder bore
11. Discharge mower deck—a support unit for the rotating blades that also provides a passage for the cut grass to be discharged, usually to the side of the cutting unit
12. Engine block—the main structure of an engine that supports and helps maintain alignment of internal and external components
13. Environmental Protection Agency (EPA)—a federal agency established in 1970 to control and abate pollution in the areas of air, water, solid waste, pesticides, radiation, and toxic substances
14. Flywheel—a component on the end of a crankshaft that keeps it turning between power strokes
15. Fuel injector—a component in the cylinder head that sprays fuel into the cylinder in an atomized form
16. GPA—gallons per acre

17. Governor—controls speed
18. Ground-driven reel—wheel mowers that use the wheel contact to ground as the power source to turn the reel
19. Hydraulic-driven reel—mowers that use hydraulic power
20. Injection pump—driven by camshaft gear as it pumps a measured amount of diesel fuel under pressure to each injector
21. Internal combustion engine—an engine that generates head energy from the combustion of fuel inside the engine
22. Mower operator—a person responsible for properly driving the pulling unit and the proper adjustment of each mower throughout the day as needed
23. Multicylinder—more than one cylinder served by one crankshaft
24. Nozzle—a device located on the boom that delivers the correct spray pattern to the turf
25. Octane—a rating of gasoline based upon its antiknocking characteristics
26. Operator—the person who operates the equipment applying pesticide
27. Piston—a plug that moves up and down in the cylinder bore
28. Piston rings—located in the piston groove that provides a seal at the cylinder wall
29. Pressure gauge—a gauge used to measure pressure in pounds per square inch (PSI) in the sprayer system
30. Pump—a mechanical device driven by a power source to create a flow of liquid in the sprayer system
31. Reel—a curved, rotating blade of tempered steel
32. Regulator valve—a device located between the nozzles and holding tank on the return side; used to regulate pressure in the sprayer system
33. Valves—provide entrance into combustion chamber for filtered air

Unit 6: Human Resources & Financial Management

1. Benefits—coverage provided by the employer in addition to a wage or salary, such as housing, meals, uniforms, travel costs, medical insurance, sick leave, and vacation leave
2. Budget—a financial plan for the future
3. Communication—conveying and receiving information
4. Depreciation costs—lost value caused by time and use of the item
5. Employee recruiting—the process of finding qualified workers for a turf company or enterprise
6. Equipment costs—any money used to purchase new equipment or make equipment repairs
7. Financial management—the practice of managing money using a flexible budget and proper purchasing
8. Job interviewing—a meeting between a prospective employee and the people who are hiring
9. Labor costs—salaries and wages of employees
10. Maintenance costs—any costs incurred for purchasing fertilizers, pesticides, tools, turf grass seeds, sod, and uniforms
11. Networking—using personal and professional contacts to help a prospective employee find a job
12. Purchase order—a paper agreement between a turf enterprise and a supplier
13. Record—a format on which to record any financial or management event
14. Renovation costs—any costs for renovation of a turf
15. Revenue—the income of a golf course or a turf enterprise
16. Salary—payment to employees on an annual basis
17. Turf manager—a leader or supervisor of a lawn-care company, golf course, sports field, or park
18. Wage—hourly rate of payment to employees